Manoeuvring chemical reactions one degree of freedom at a time

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The combined use of electric fields, magnetic fields and laser light affords us an ever-increasing level of control over the properties of atoms and molecules, enabling reactivity to be probed as a function of their various degrees of freedom [1]. Here, we discuss how electrostatic deflection [2] can be employed to disentangle the reactivity of molecules in different rotational states [3], or with different spatial orientation of their constituent atoms [4]. We demonstrate for the first time the sympathetic cooling of different conformational isomers within a Coulomb crystal [5], setting the scene for fully conformationally selected ion–molecule reaction studies. Finally, we present our plans to investigate rotational-state-selected carbon astrochemical reactions with the aim of establishing whether state-selected reactivity should be included in the astrochemical models of interstellar clouds [6].

Références

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